

CLAIMS

1. A method of displaying alternans data of an electrocardiogram signal, the electrocardiogram signal having a plurality of odd beats and a plurality of even beats, the method comprising:
 - calculating an odd median complex for at least one of the plurality of odd beats, the odd median complex having a plurality of odd data points;
 - calculating an even median complex for at least one of the plurality of even beats, the even median complex having a plurality of even data points;
 - comparing the plurality of odd data points with the plurality of even data points to generate a plurality of difference data points;
 - assigning each one of the plurality of difference data points a color corresponding to an amplitude;
 - displaying the plurality of difference data points as a difference curve; and
 - generating a plurality of difference curves and displaying the plurality of difference curves in a temporal alignment.
2. A method as set forth in claim 1 and further comprising generating a plurality of absolute difference data points.
3. A method as set forth in claim 1 and further comprising distinguishing between alternans distribution and artifact distribution.
4. A method as set forth in claim 1 and further comprising displaying the plurality of difference curves in a temporal alignment as a two-dimensional representation.
5. A method as set forth in claim 1 and further comprising displaying the plurality of difference curves in a temporal alignment as a three-dimensional representation.
6. A method as set forth in claim 1 and further comprising assigning a true color to each one of the plurality of difference data points.

7. A method as set forth in claim 1 and further comprising assigning a shade of gray to each one of the plurality of difference data points.
8. A method as set forth in claim 1 and further comprising assigning to each one of the plurality of difference data points X and Y coordinates and plotting each one of the plurality of difference data points to produce a two-dimensional representation.
9. A method as set forth in claim 1 and further comprising assigning to each one of the plurality of difference data points X, Y, and Z coordinates and plotting each one of the plurality of difference data points to produce a three-dimensional representation.
10. A method as set forth in claim 1 and further comprising assigning to each one of the plurality of difference data points X, Y, and Z coordinates and scaling the Z coordinate to a zero value to generate a two-dimensional colored density diagram of the alternans data.
11. A method as set forth in claim 1 and further comprising assessing the quality of the alternans data using detected trends in the alternans data.
12. A method as set forth in claim 11 and further comprising providing an input for manual correction of the alternans data.

13. An apparatus for displaying alternans data of an electrocardiogram signal, the electrocardiogram signal having a plurality of odd beats and a plurality of even beats, the apparatus comprising:

a display; and

a processor that produces a representation of the alternans data, the processor

calculating an odd median complex for at least one of the plurality of odd beats, the odd median complex having a plurality of odd data points;

calculating an even median complex for at least one of the plurality of even beats, the even median complex having a plurality of even data points;

comparing the plurality of odd data points with the plurality of even data points to obtain a plurality of difference data points;

assigning each one of the plurality of difference data points a color corresponding to an amplitude;

displaying the plurality of difference data points as a difference curve on the display; and

generating a plurality of difference curves and displaying the plurality of difference curves on the display in a temporal alignment.

14. An apparatus as set forth in claim 13, wherein the processor displays at least one indicator corresponding to at least one portion of the alternans data.

15. An apparatus as set forth in claim 14, wherein the at least one indicator includes a QRS-end indicator.

16. An apparatus as set forth in claim 14, wherein the at least one indicator includes a T-end indicator.

17. An apparatus as set forth in claim 13 wherein the display is one of a black and white display capable of displaying a plurality of shades of gray and a red-blue-green color display capable of displaying true colors.

18. An apparatus for displaying T-wave alternans data from an electrocardiogram, the apparatus comprising:

a display; and

means for producing a spatiotemporal representation of the T-wave alternans data on the display.

19. A method of quantifying alternation in an electrocardiogram signal having a plurality of beats, the method comprising:

receiving digitized electrocardiogram data representing the electrocardiogram signal;
calculating odd median complexes for odd beats in the electrocardiogram data;
calculating even median complexes for even beats in the electrocardiogram data;
comparing the odd median complexes with the even median complexes to obtain estimates of the amplitude of beat-to-beat alternation in the electrocardiogram signal;
generating difference curves from the estimates of the amplitude of beat-to-beat alternation; and
displaying the difference curves as a spatiotemporal representation of the beat-to-beat alternation in the electrocardiogram signal.

20. A method as set forth in claim 19 and further comprising obtaining absolute difference estimates of the amplitude of beat-to-beat alternation in the electrocardiogram signal.

21. A method as set forth in claim 19 and further comprising distinguishing between alternans distribution and artifact distribution.

22. A method as set forth in claim 19 and further comprising displaying the difference curves in a temporal alignment as a two-dimensional representation.

23. A method as set forth in claim 19 and further comprising displaying the difference curves in a temporal alignment as a three-dimensional representation.

24. A method as set forth in claim 19 and further comprising assigning a true color to each one of the estimates of the amplitude of beat-to-beat alternation.

25. A method as set forth in claim 19 and further comprising assigning a shade of gray to each one of the estimates of the amplitude of beat-to-beat alternation.

26. A method as set forth in claim 19 and further comprising assigning to each one of the estimates X and Y coordinates and plotting the estimates to produce a two-dimensional representation.

27. A method as set forth in claim 19 and further comprising assigning to each one of the estimates X, Y, and Z coordinates and plotting the estimates to produce a three-dimensional representation.

28. A method as set forth in claim 19 and further comprising assigning to each one of the estimates X, Y, and Z coordinates and scaling the Z coordinate to a zero value to generate a two-dimensional colored density diagram.

29. A method as set forth in claim 19 and further comprising providing an input for manual correction of the alternans data.